Faster. More accurate. Less stressful.

cmPALS sets a new standard for zeta potential measurement.

Zeta potential is a key indicator of particle stability in liquid dispersions. A high zeta potential — positive or negative — means strong electrostatic repulsion and a stable system; a low one means aggregation risk. Getting this data right is critical for formulation development, quality control, and product shelf-life prediction.

The Measurement Challenge

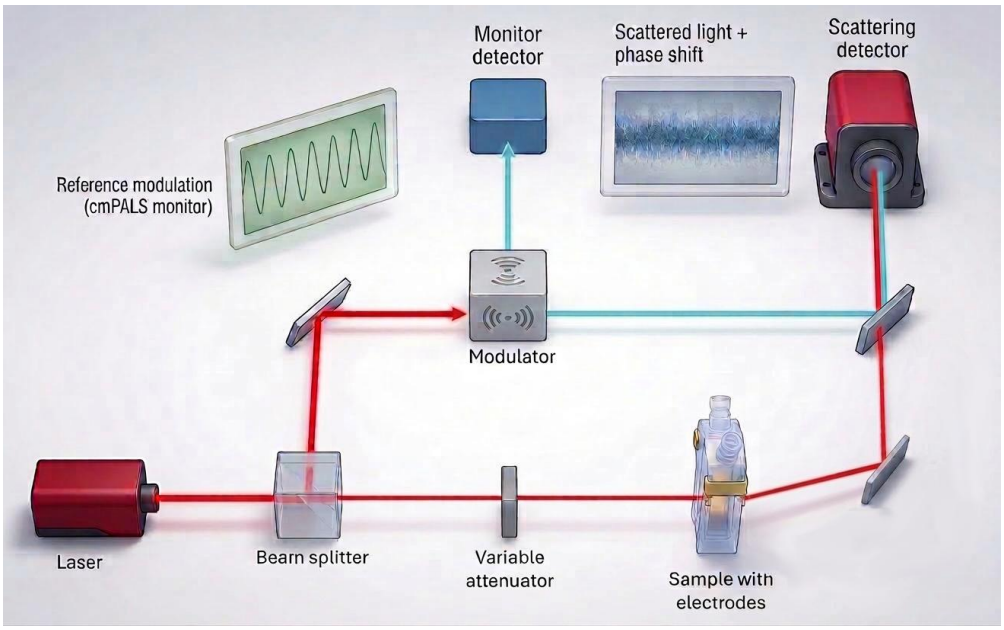
Zeta potential is measured by observing how particles migrate in an applied electric field. Two unavoidable physical effects complicate this: electroosmosis (fluid movement that obscures true particle motion) and Joule heating (temperature rise from the electric current that alters sample behavior). Managing both requires low applied voltages and short measurement times — exactly the conditions where measurement technique matters most.

Standard Phase Analysis Light Scattering (PALS) improves sensitivity over earlier methods by adding a modulator, which allows the system to detect both speed and direction of motion. However, PALS relies on a calculated reference signal. Over time, this estimate drifts due to instrument nonlinearity, temperature changes, or component aging. For sensitive samples or rapid measurements, that drift introduces errors that cannot be corrected after the fact.

How cmPALS Works

cmPALS — **continuously monitored** Phase Analysis Light Scattering — eliminates this problem at the source. Rather than calculating the reference signal, it measures it live and in parallel with the sample signal throughout the entire measurement.

Real-time correction means no accumulated drift and no reliance on assumptions about instrument stability. The result: accurate measurements at lower applied voltages, in less time, and with less thermal stress on your sample — without any trade-off in data quality.



How does the laser detect particle movement?

A focused laser beam illuminates the sample. As particles migrate in the electric field, they shift the frequency of scattered light (Doppler effect). cmPALS captures this shift precisely by simultaneously tracking a live reference signal — so any drift is corrected as it happens, not estimated afterward.

Why does the reference signal matter?

In standard PALS, the reference signal is calculated — a mathematical estimate that can diverge from reality as temperature, voltage, or instrument components change. cmPALS physically measures it in real time. That single architectural difference is what makes the performance gap in the tables possible.

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Proven Performance: cmPALS vs. PALS

To directly compare both techniques, zeta potential was measured on a latex standard (0.05% in 10 mM NaCl) across a range of applied voltages using a Litesizer DLS (cmPALS) and a conventional PALS instrument. The tables below show the full results.

Table 1. Varying measurement time at fixed voltage

Table 1 shows that even with very short measurement times, the Litesizer DLS maintains low standard deviation, while conventional PALS requires significantly longer measurements and still returns higher variability.

Anton Paar cmPALS		
Zeta potential / mV	SD / mV (RSD)	Time / s
− 61.2	± 0.7 (1.1 %)	10
− 61.0	± 0.7 (1.1 %)	8
− 61.3	± 0.1 (0.2 %)	6
− 60.9	± 0.5 (0.8 %)	4
− 60.9	± 0.4 (0.7 %)	2
Mean: − 61.0 ± 0.5		
RSD: 0.8 %		

PALS		
Zeta potential / mV	SD / mV (RSD)	Time / s
− 57.9	± 1.8 (3.1 %)	31
− 57.3	± 2.3 (4.0 %)	26
− 59.7	± 1.3 (2.2 %)	13
− 57.1	± 2.1 (3.7 %)	5
− 58.1	± 2.6 (4.5 %)	3
Mean: − 58.0 ± 2.0		
RSD: 3.4 %		

Table 2. Varying applied voltage

Table 2 shows the same advantage at low applied voltages: cmPALS preserves both speed and repeatability, where PALS degrades. This matters directly for sensitive samples where high electric fields risk heating or degrading the material.

Anton Paar cmPALS			
Zeta potential / mV	SD / mV (RSD)	Applied voltage / V	Time / s
− 61.2	± 0.7 (1.1 %)	200	10
− 58.0	± 0.5 (0.9 %)	100	10
− 55.0	± 0.3 (0.5 %)	50	14
− 55.0	± 1.2 (2.2 %)	20	11

PALS			
Zeta potential / mV	SD / mV (RSD)	Applied voltage / V	Time / s
− 57.9	± 1.8 (3.1 %)	148	31.2
− 57.3	± 1.0 (1.9 %)	100	31.2
− 59.7	± 1.6 (3.3 %)	50	36.4
− 57.1	± 3.0 (6.5 %)	20	70.2

Short measurement time. Low applied voltage. No compromise on quality.

The data confirms what the technology predicts. cmPALS delivers faster measurements with better repeatability, at gentler conditions. For sensitive samples — biologics, emulsions, complex formulations — this is not a marginal improvement. It is the difference between a measurement you can trust and one you cannot.

Learn more

https://www.anton-paar.com/corp-en/products/details/litesizer/

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